W. L. Robison

Dietary and Living Patterns.

Enewetak Radiological Survey.

U. S. Atomic Energy Commission, Nevada Operations Office, Las Vegas, NV, NVO-140, Vol. 1 (1973) pp. 492-498.

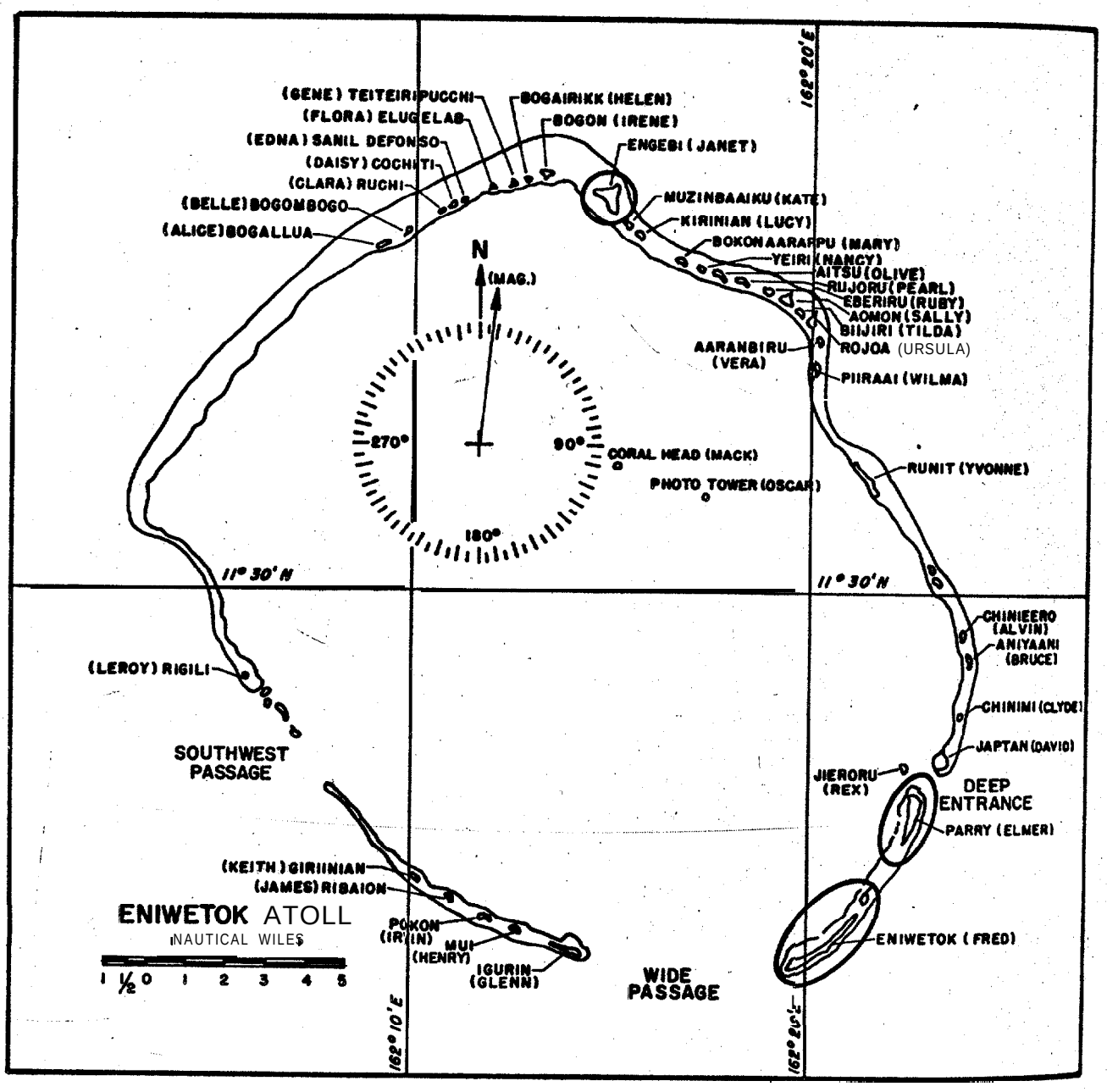

Fig. 116, Islands (those circled) requested as village locations by the Enewetak people.

Dietary and Living Patterns

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Living Patterns

The Enewetak people have expressed a desire to make Parry-Enewetak and Engebi the residence islands for the two Enewetakese socio-political groups (see chapter on Enewetak). Figure 116 shows the Atoll and the islands chosen for village locations. The separation of the two socio-political groups was the life-style prior to evacuation, with the Engebi people and their chief headquartered on Engebi and the Enewetak people and their chief headquartered in the southern part of the Atoll.

Our dose estimates are therefore

Table 135. Living patterns describing the geographical locations for activities involved in daily living.

	Pattern I	Pattern II
Residence	Enewetak, Parry	Enewetak, Parry
Agriculture	ALVIN through KEITH	KATE through WILMA + LEROY
Fishing	Entire Atoll	Entire Atoll

	Pattern III	Pattern IV
Residence	JANET	BELLE
Agriculture	JANET	BELLE
Fishing	Entire Atoll	Entire Atoll

	Pattern V	Pattern VI
Residence	JANET	JANET
Agriculture	KATE through WILMA + LEROY	ALICE through IRENE
Fishing	Entire Atoll	Entire Atoll

based upon these islands as the village areas, with visits to other islands for planting and collection of food. Generally, people living on Engebi own land on the neighboring islands, i. e., in the northern half of the Atoll, while those living on Parry and Enewetak own land on the islands in the southern half of the Atoll. These nearby islands would be used for additional agriculture and food collection by the two respective groups.

As a result of the above-menticked desires of the Enewetak people, the six different living patterns shown in Table 135 have been synthesized for estimating the potential dose to the returning population. For estimating the dose via the terrestrial food chain, islands are grouped according to a common range of external exposures and radionuclide concentrations in the soil; these groups are shown in Fig. 117. JANET and YVONNE are listed individually (Groups II and IV) and LEROY is included in the Group III islands, KATE through WILMA.

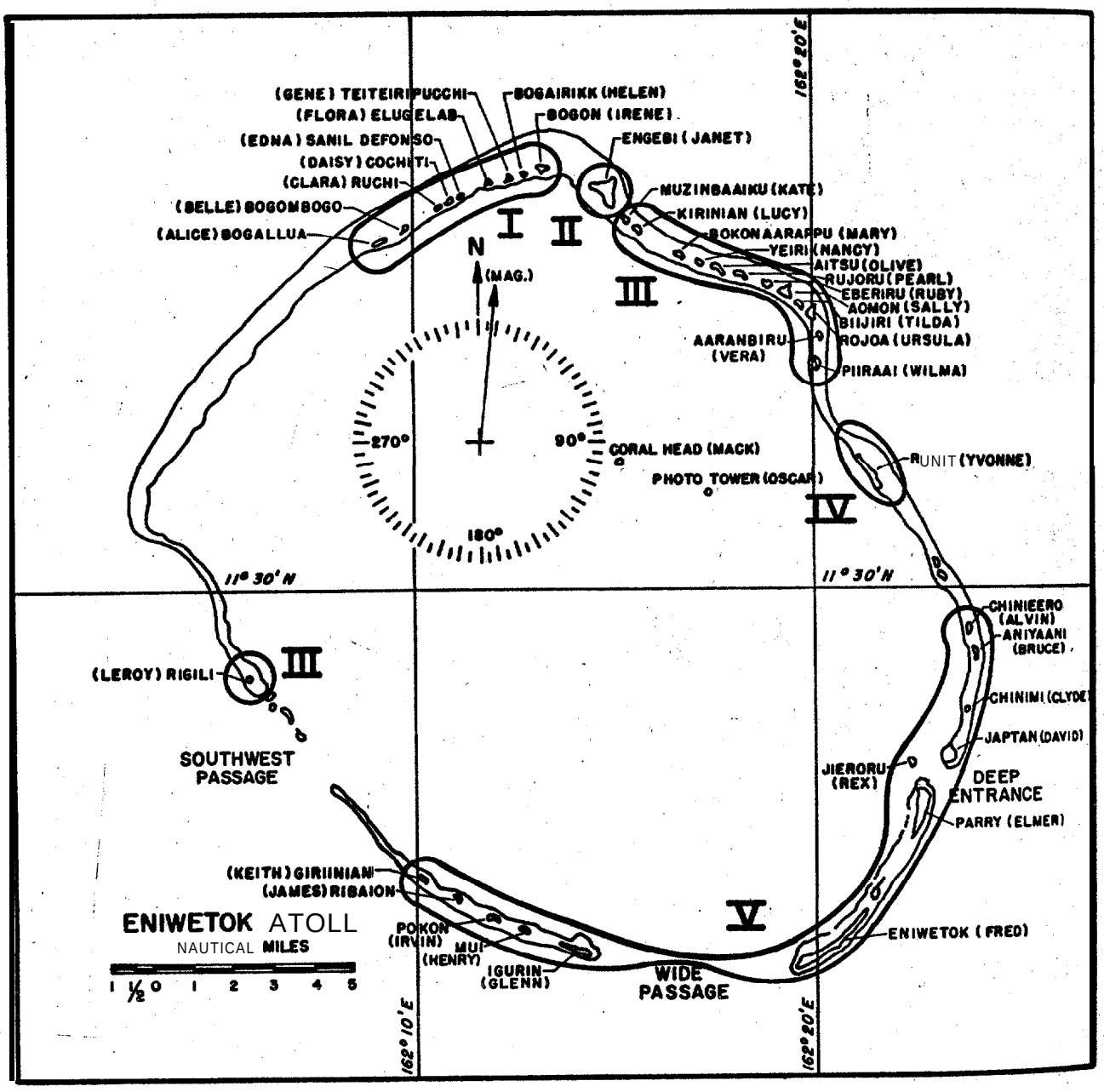

Fig. 117. Island groups used for assessing the dose via the terrestrial food chain

The living patterns are designed to include the most probable circumstances which will occur when the inhabitants return (patterns I, II, III, V, and VI), as well as a more extreme exposure situation which could occur (pattern IV). The effects on total dose of these various living patterns will be discussed in the sections dealing with the external exposure, the exposure via food chains and in the section describing the total doses via all pathways.

The distribution of time between village, interior, beach, lagoon, and other islands is shown in Tables 136 and 137. The breakdown is based upon reports by Jack Tobin from his years of experience in the Marshall Islands and from Ken

fable 136. Estimated time distribution (in percent) for men, women, children, and infants, with emphasis on residence island. Pattern A.

	Village area	Beaches.	Interior	Lagoon	Other islands
Men	50	5	15	10	20
Women	60	10	10	0	20
Children	55	10	15	5	15
infants	85	5	0	0	10

Table 137. Estimated time distribution (in percent) for men, women, children-, and infants with emphasis on additional time spent on nonresidence islands. Pattern B.

	Village area	Beaches	Interior	Lagoon	Other islands
Men	40	5	20	10	25
Women	50	5	15	5	25
Children	50	5	15	10	20
Infants	70	5	5	0	20

Table 136. Population distribution of Enewetak.

Age groups		Percentage of total population,
Infants (O-5 yr)	Male	1 2
	Female	1 0
Children (6-18 yr)	Male	21
	Female	2 1
Adults (19-50 yr)	Male	18
	Female	14
Adults (over 50)	Male	2
	Female	2

Total population. 432
On Ujilang now 340

Table 139. Postulated diet for the returning adult Enewetak population for time of return and for 10 yr after initial return.

Food item	Diet, g/day	
	At time of return	10 yr after return
Fish	600	600
Domestic meat	60	100
Pandanus fruit	0	200
Breadfruit	0	150
Wild birds	100	20
Bird eggs	20	10
Arrowroot	0	40
Coconut	100	100
Coconut mills	100	300
Coconut crabs	25	25
Clams	25	25
Garden vegetables	0	0
Imports	200-1000	200-1000
	1030 plus imports	1570 plus imports

Marsh who observed the Enewetak people on Ujilang and interviewed them as to their probable habits upon return to Enewetak Atoll.

Table 137 differs from Table 136 in that it increases the time spent in locations other than the residence island; this may be the situation during the first years of return while the inhabitants are cultivating and reestablishing the agricultural islands.

The population distribution of the Enewetak people, as determined by a census conducted by Dr. Jack Tobin in the fall of 1973, is shown in Table 138.

Diet

The composition of the diet shown in Table 139, both at the time of initial reinhabitation of the Atoll and 10 yr after return, was compiled from reports and interviews of Jack Tobin of the Trust Territories, Ken Marsh of LLL, Vic Nelson of the University of Washington, and Dr. Mary Murai, a nutritionist at the University of California, Berkeley, who spent a number of years living on Majuro and visited several of the atolls in the Marshall Islands. The reports by Tobin, Marsh, and Nelson are included in this report. Dr. Murai contributed through private discussion and through her publication "Nutrition Study in Micronesia," Atoll Research Bulletin No. 27 (1954), issued by the Pacific Science Board National Academy of Sciences — National Research Council.

The diets listed are intended to represent the average diet if the Atoll resources and Atoll agriculture are pursued in a manner similar to that prior to removal of the people from the Atoll for the testing program.; The diet from 0 to 10 yr reflects the current Lack of significant

quantities of pandanus, breadfruit and coconuts, all of which will have to be planted upon return and all of which have 7- to 10-yr development periods before contributing edible fruit to the diet.

The general opinion of all the sources listed above is that imports of rice, flour, tea, canned fish (tuna, mackerel, salmon, etc.) and canned meats will probably be major components in the diet of the Enewetakese because they are now accustomed to such living. They prefer to establish a cash economy and purchase most of their needed food items. It would therefore appear that dose calculations based upon the dietary intake per se shown in Table 139 may overestimate the total dose via the food chains; however, a brief comment on each of the items listed for both diets is in order.

Fish — The 600-g/day average intake, both initially and 10 yr after return, is probably a high estimate in view of the dietary and living habits of the people today. Bones and viscera of fish, dark muscle of tuna, and invertebrates such as sea cucumbers are not eaten by the natives.

Domestic Meat — This commodity is likely to be in shorter supply upon return than later because the people do not have sufficient room to raise many head of livestock where they presently live. and it will take time to increase the pig and chicken population.

Pandanus Fruit — There are fewer than 10 pandanus plants on the-entire Atoll at present; New plants will have to be started and will bear fruit about 8-10 yr after planting.

Breadfruit — No breadfruit trees were encountered in the survey. Again a program of replanting will be necessary, with a subsequent period of approximately 8-10 yr before edible fruit is available.

Wild Birds and Bird Eggs — Wild birds are plentiful now, but the population will probably be depleted when the 400 people return.

Arrowroot — Very small patches of arrowroot were observed on the southern islands, with one larger patch observed on DAVID. Arrowroot will therefore have to be planted. However, the people have indicated that they much prefer imported white wheat flour and would only use arrowroot as a second choice.

Coconut and Coconut Milk — Islands in the southern half of the Atoll, especially Parry, FRED, and GLENN, have a large enough coconut crop to supply the people who first. return. More coconut groves will be established on the other. islands; however it takes approximately 8-10 yr for coconut trees to become productive and useful.

Coconut Crabs — The crab population now parallels that of the coconut trees in distribution. As more trees are planted, the coconut crab can be reintroduced to the other islands. The only question may be how rapidly the returning people harvest the available crabs and how well they practice conservation of this species. The people consider the crab a delicacy and could easily decimate the population.

Clams — Giant clams (Tridacna) are eaten raw and almost exclusively by the men during fishing trips. If the clams are not harvested under controlled conditions, they could be depleted to a stage where there would be few available in 10 yr.

Garden Vegetables — Very few garden vegetables will probably be available if current agricultural practices are continued. Terrestrial plants and garden crops, if planted, are allowed to grow in' natural surroundings with very little organized gardening, i. e. , no fencing or protected areas. The people prefer not to have high-maintenance agricultural situations. At the same time, their livestock, mostly pigs and chickens, are allowed complete freedom to roam as they please. The combination of low-intensity open agriculture and the uncontrolled meandering of the livestock tends to make fresh garden vegetables an unlikely component of the diet.

Imports — A large part of the diet is expected to consist of imported products. It is possible that imports will supply nearly the whole diet, with local marine and terrestrial products serving only in a limited way and on special festive occasions. If this should be the case, then the doses incurred by the returning population via the marine and terrestrial food chains will be far below those listed in this report.

External Dose Determination

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As described in the earlier sections on the EG&G aerial survey and photography, the terrestrial soil and radiation survey, and external dose estimates, gamma-ray exposure rates have been measured in this program by aerial survey, hand-held instruments, and thermoluminescent dosimeters. The three techniques yield the same results within ± 10%; in the section on external dose estimates it was stated that the aerial-survey data would be used for those estimates. Average dose rates as obtained from the aerial survey are summarized in Table 140.

Even though wide variations in gamma-ray exposure rates were measured throughout the northern islands, it was necessary, for the purpose of the dose calculation, to derive the most reasonable values of the current mean exposure rates for each specific geographical area under consideration. These values are shown in Table 141 for the living patterns of Table 135. The mean exposure rates for specific areas of JANET were obtained by examination of the ^{137}Cs and ^{60}Co iso-exposure-rate contour maps provided by the aerial survey. The village area was assumed to lie along the lagoon side of the island. The mean values given for the northern islands were. obtained by weighting the mean exposure rates for each individual island with the area Of each island. Since the minor contamination of the southern islands is relatively Uniform, the mean ^{137}Cs and ^{60}Co es-